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Special Effects: Secrets of 'The Black Hole'

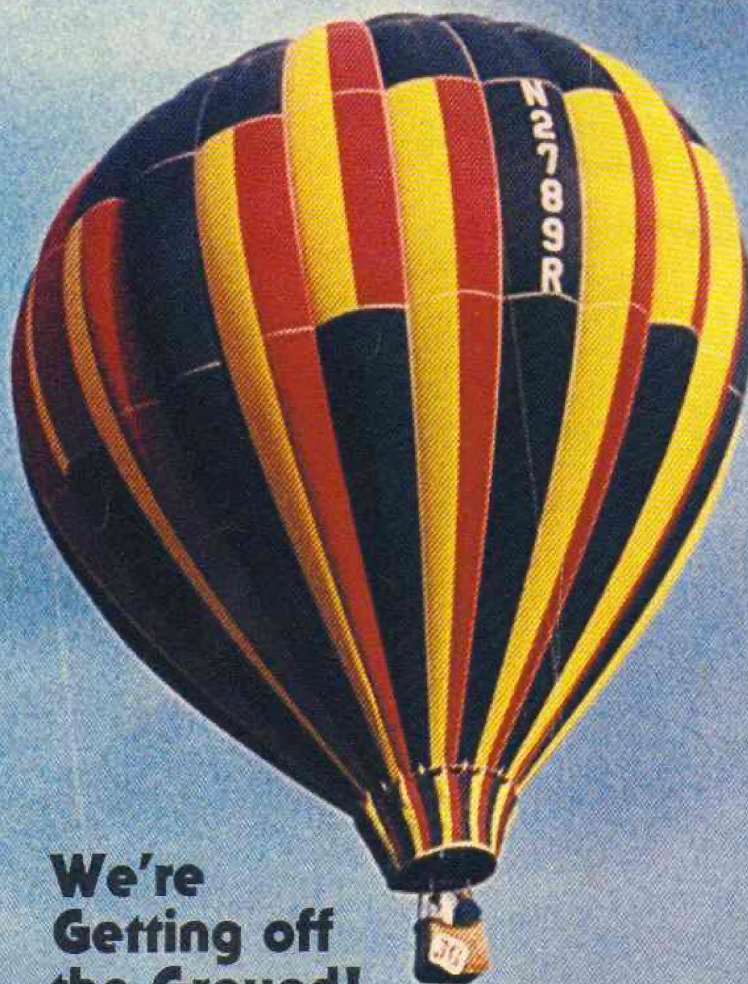


Inside Your TV
Kids Invent
a Language
The Life of
a Star



Much
More!





We're Getting off the Ground!

On January 14th, a brand new TV show will arrive. Its name is 3-2-1 CONTACT. Sounds familiar, doesn't it?

The show is all about science and the world around you. When it arrives on January 14th, why not tune in for a look? And be sure to get next month's CONTACT Magazine. Inside you will find a special pull-out section all about our new television show!

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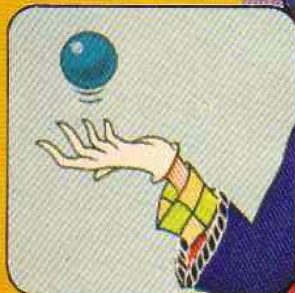
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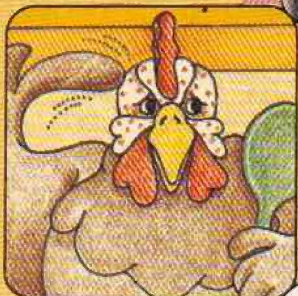
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THE BLACK HOLE

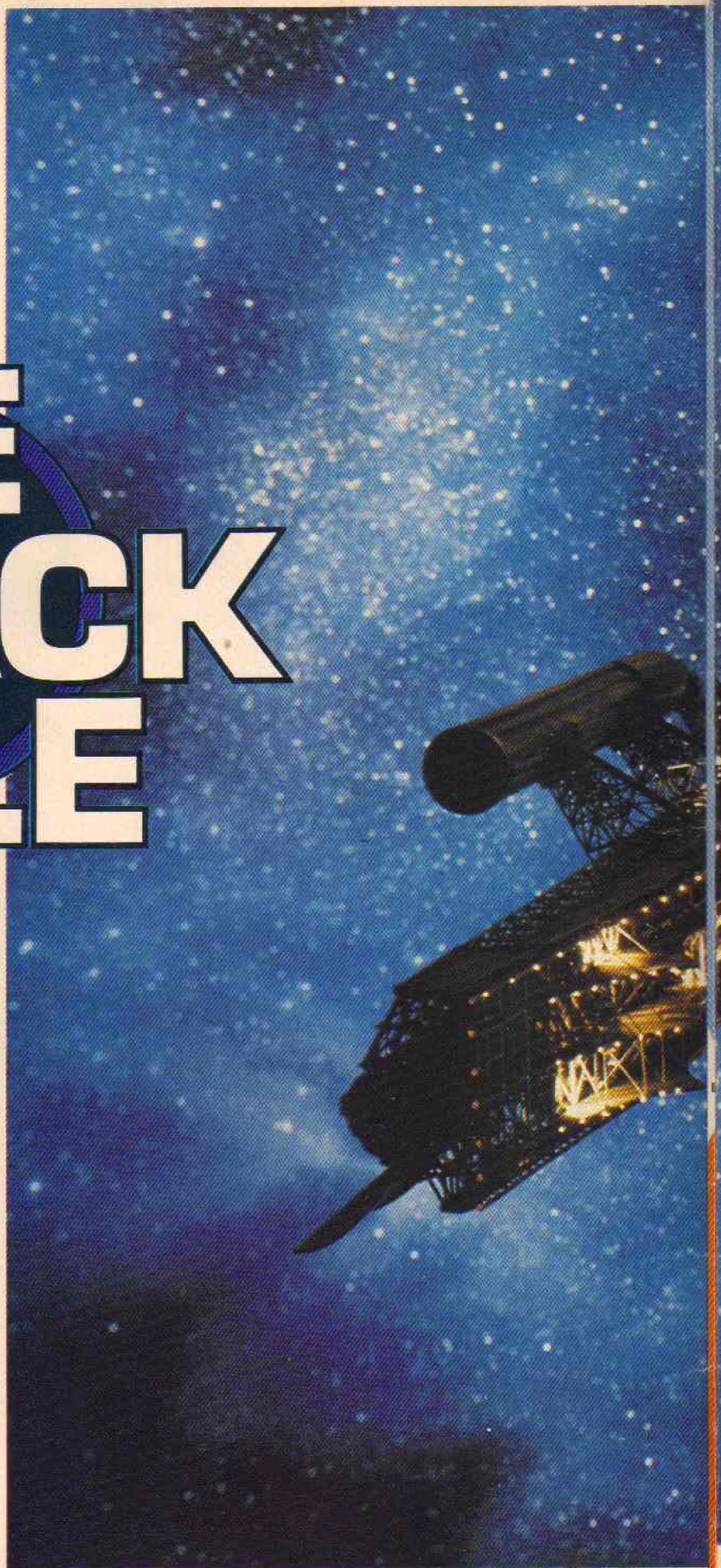
THE MOVIE'S SPECIAL EFFECTS STEAL THE SHOW

By Carol Mithers

It's called science fiction, but it looks like magic. On the movie screen, a robot attacks Dr. Durant. Its hands are made of whirling metal blades. Durant falls against the instrument panel in his spaceship. Suddenly his body is covered with flashing lines of blue electricity.

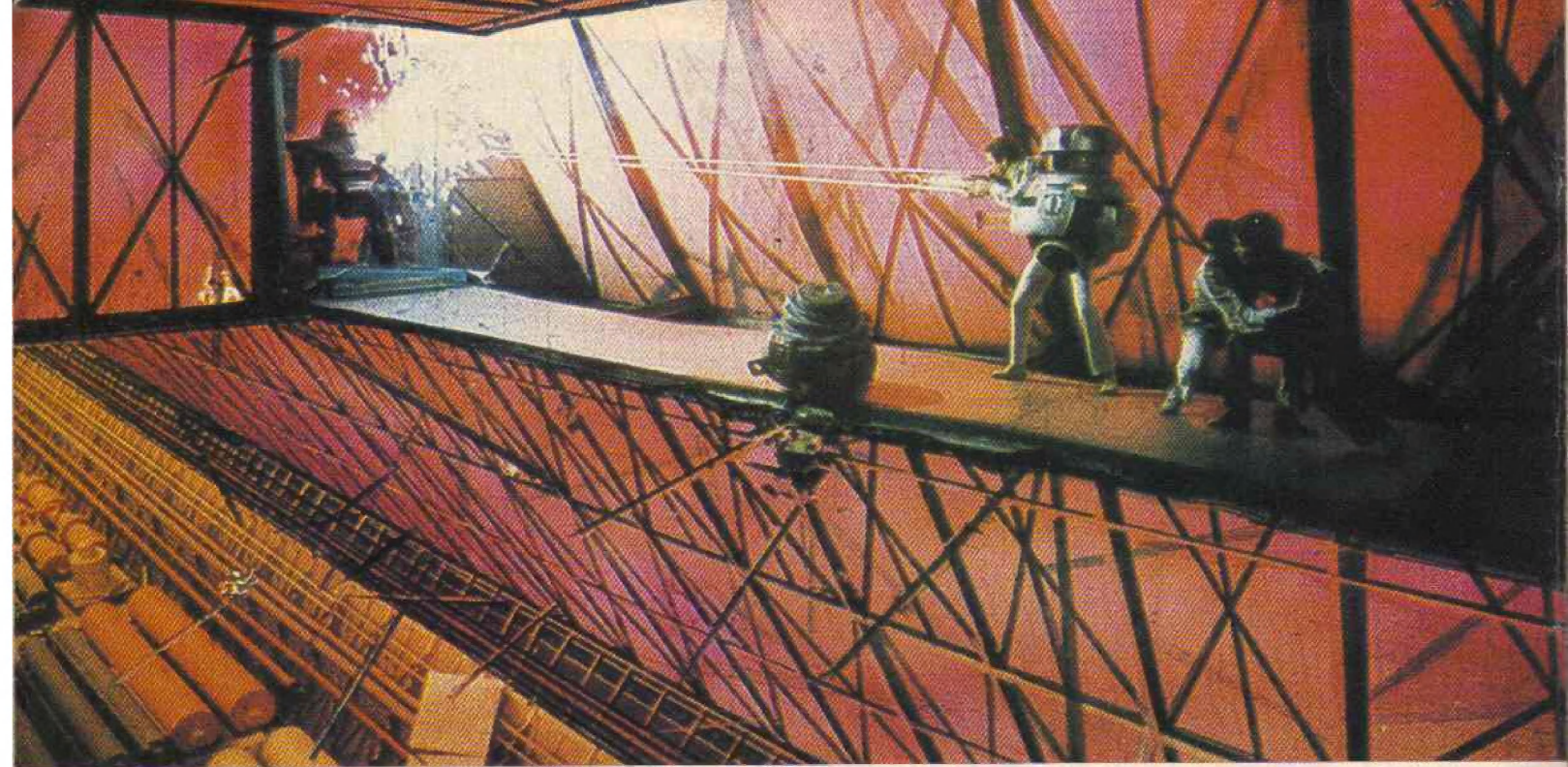
The movie is called *The Black Hole*. It's the story of the spaceship *Palomino*, whose crew discovers another ship called the *Cygnus*. The *Cygnus* has been missing for 20 years. It is trapped on the edge of a black hole.

Black holes are mysteries, even to scientists. Astronomers think that





It looks like a giant spaceship, but the *Cygnus* is really only a 12-foot-long model.



Special effects make you see things that aren't there. The big machines at the bottom of the *Black Hole* scene are just a painting.



Robot guards on the *Cygnus* patrol the spaceship's corridors.

they exist, but know very little about them. Making a movie about something that is so mysterious takes a lot of imagination. That's why some of the biggest stars of the movie are people you never see. They are the special effects experts. It was their job to make the spectacular scenes in the movie.

The Secrets

There are more than 500 special effects in the movie. Not all are done the same way. They are made using different tricks. Here is how three of the special effects of *The Black Hole* were done:

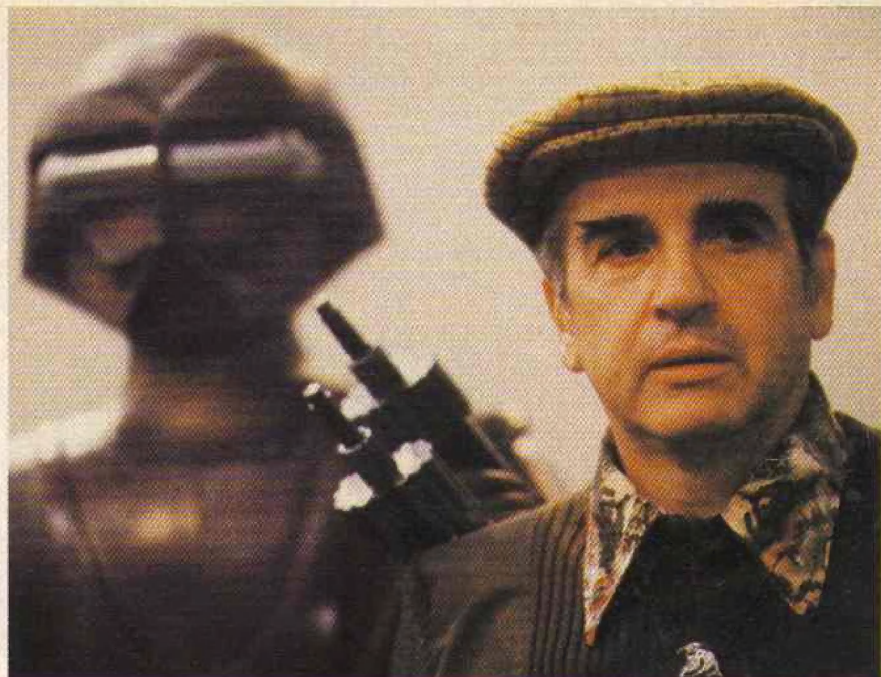
1. What You See: Dr. Durant is attacked by the killer robot, Maxamillian. When he falls against the instrument panel, his body is covered with bright blue electricity.

How They Do It: The trick is to put two pictures together and to make them look like one. One picture is of Dr. Durant. The other is of the flashing blue lights.

First they make a film of Dr. Durant falling against the instrument panel. Actor Tony Perkins, who stars as Durant, pretends that the flashing blue light is all around him.

Now they must add the blue light. Each picture on the film (called a *frame*) is made larger. Then artists draw the blue light around

Right: Special effects expert Joe Hale and a *Black Hole* robot.
Below: Captain Dan Holland and Dr. Kate McCrae in the command room of the *Palomino*.





A tiny probe blasts off from the huge spaceship *Cygnus*.

Perkins. They must draw this frame by frame. Now when the film is run, it looks like the blue light was there all along.

Many other things you see are done the same way, including the fiery rocket blasts from the *Cygnus* and the bolts of light from the laser guns.

2. What You See: In front of you is the U.S.S. *Cygnus*. When its rockets blast, it slowly moves, trying to escape from the pull of the black hole.

How They Do It: There are two steps to this special effect. First the spaceship has to be built. Then it has to be made to look like it is flying through space.

If the whole ship were built to size, it would be more than 1,000 feet long. That would make it bigger than the movie studio! Instead, a model must be made, like a model plane you might build. This beautiful model, made out of copper and brass, is 12 feet long. It took over six months to build. If you could see someone next to it, you would know right away it isn't big enough to be a real spaceship. But you only get to see it in deepest, darkest space. So on the movie screen there's no way of knowing how big it really is.

Now how do they get this spaceship to move? They put it in front of a black background and take a picture. Then they move the camera a tiny bit and take another picture. Then another and another and another. When all these pictures are shown one after another, it looks like the *Cygnus* is moving through space.

3. What You See: There's a giant battle between the robots from the *Cygnus* and the people from the *Palomino*. They chase each other all over the ship, firing laser blasts as they go.


How They Do It: That's a good question. If the spaceships are only tiny models, there's no way all those people could fit inside!

These special effects were done by matte (mat) artists. Here's how a matte artist works: First, the robots and actors are filmed fighting. This film is then projected on a large piece of glass. The picture only covers part of the glass. The rest is blank. The matte artist paints the background right on the blank piece of glass. The whole scene with the new background is filmed again. Now it looks like it took place inside a giant spaceship.

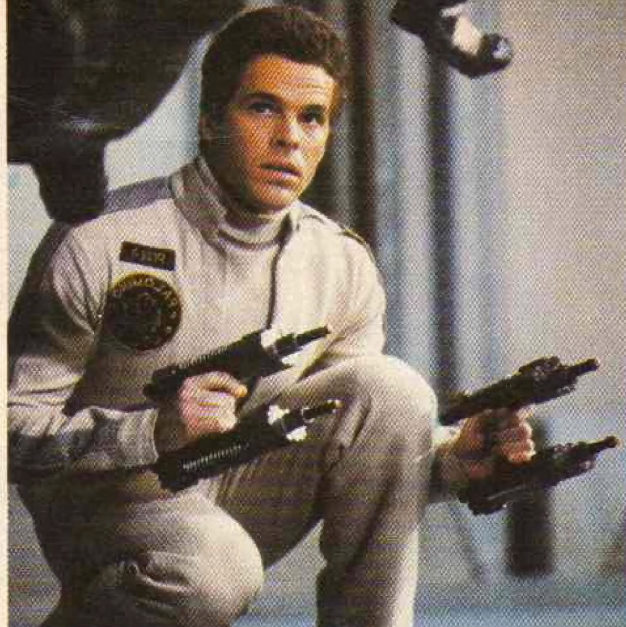
A matte drawing must be done right. If not, the whole thing will look fake. Each matte takes about 30 hours to do. In *The Black Hole*, they had to do 150 different drawings!

The Dig Finish

All this sounds like a lot of work and it is. One special effect can take hours of work. Take the explosion on board the spaceship *Cygnus*. What you see in the movie lasts a couple of minutes. But it took 7,000 hours of work to make it!

It sounds incredible, but it took more than 1,500 people over two years to make *The Black Hole*. That's a lot of work for a two-hour movie. But when you see the dazzling results, you'll know it was worth the effort. 

Right:
Joseph Bottoms
plays the
Palomino's
first officer.
Below:
Human-like
creatures
work
controls
of the *Cygnus*.



REAL BLACK HOLES

POTHOLES IN SPACE

What's three times as big as the sun, totally invisible, able to destroy anything within a few miles of it, and starring as the villain in a new science fiction film?

The answer is a *black hole*, one of the strangest mysteries of outer space.

Astronomers think there may be millions of black holes in our universe. Then again, there may not be any. No one is 100% sure that black holes really exist.

What are they? Scientists think black holes are what happens after giant stars explode. If the star explodes, then gets smaller and smaller, they think it will turn into a "hole in space." The hole has very powerful gravity, which sucks into it anything that comes close. This gravity even keeps light from getting out. That makes black holes impossible to see.

How can you find an invisible thing in space? Astronomers say they can. They just look for special clues. Scientists think black holes send out powerful radiation, known as x-rays. In the early 1970s, a satellite was sent out to search for these rays. Some were discovered near the constellation Cygnus the Swan. They think that may mean there is a black hole there.

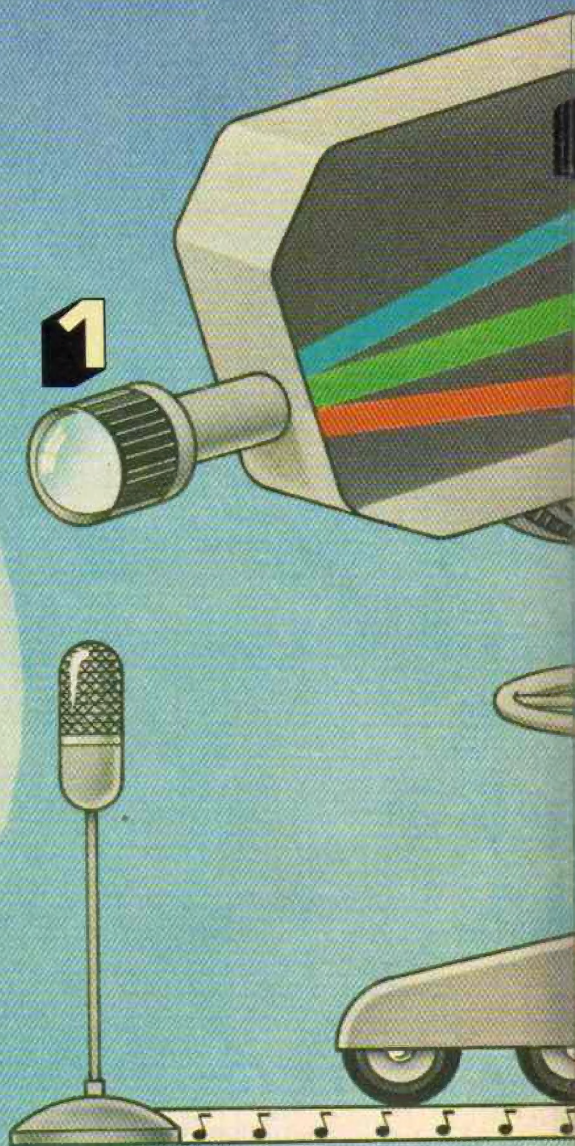
Not all stars will end by turning into black holes. Our sun, for example, has a different life cycle. For more on what will happen to it, turn to page 37. —Douglas Colligan.



How It Works

Television

By Doug Garr



You know how TV works, right? You plug it in, pick a channel and pull up a chair. But how do all your favorite shows get in there? Does each set come with a karate-chopping Miss Piggy inside? Does Mork beam down from Ork once a week?

Not quite. Three things happen before you can see a TV show. First, a camera takes a TV picture and turns it into an electric signal. Second, this signal is sent to your house. And third, your TV set turns this signal back into a TV show so that you can watch it.

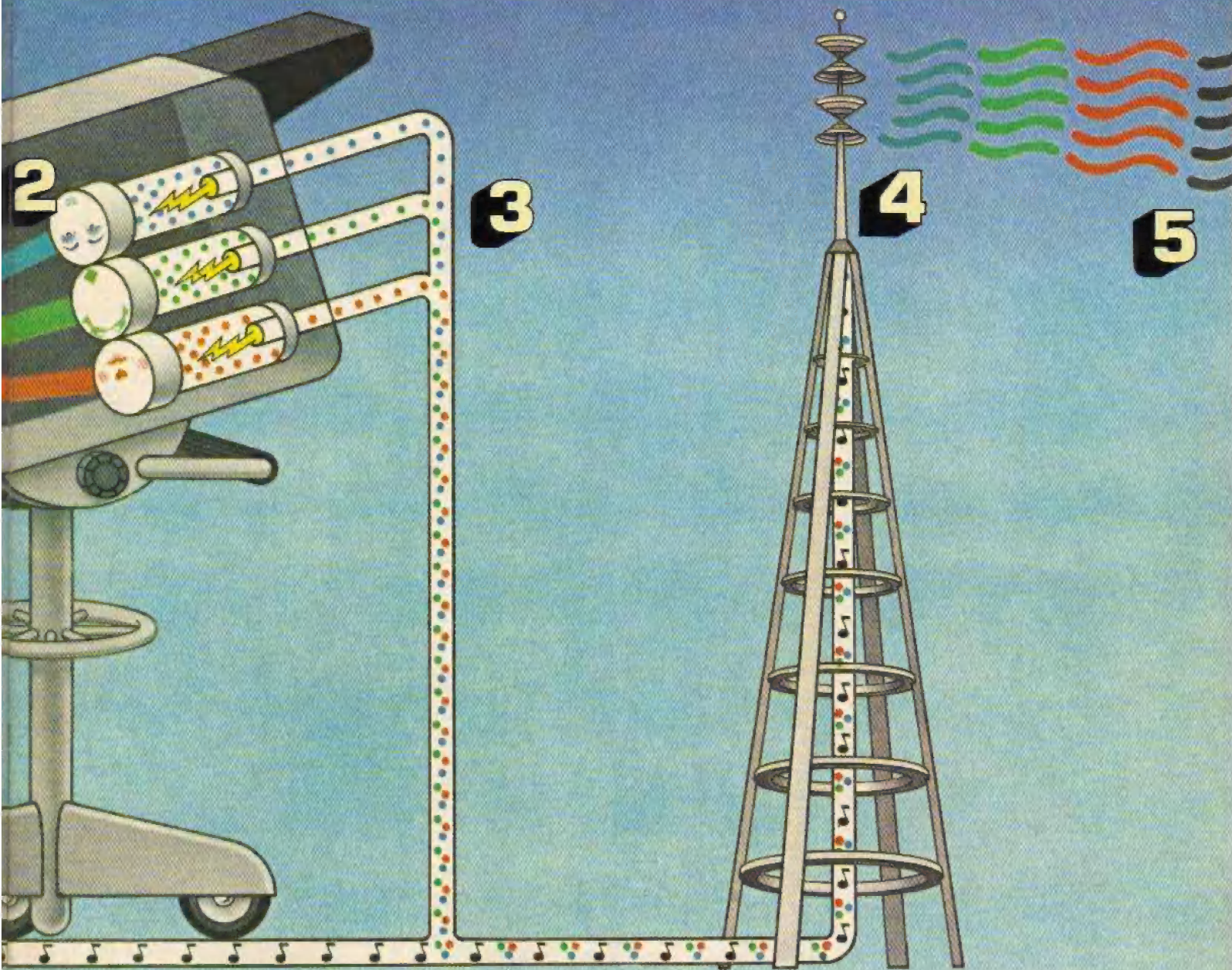
Confused? We've broken these steps into a bunch of smaller ones so that you can follow the action from start to finish.

step 1

A television camera takes a picture of a guy clowning around. The camera "sees" the action pretty much the way your eye would, if you were at the TV studio.

step 2

The television camera splits the picture of the clown into three pictures. Each picture is made up of one color. The blue parts of the clown go to the blue picture. The red goes to the red picture. And the green goes to the green picture. But wait a minute! What about the clown's purple pants? Purple is made up of red and blue. So the red part goes to the red picture, and the blue part to the blue picture. (To find



more about how colors mix to form new colors, try the experiment on page 20.)

step 3

The three colored pictures are turned into electrical signals. Each picture has a kind of gun pointing at it. These guns shoot tiny particles, called *electrons*, at the pictures. That's why they're called *electron guns*. The electrons make a record of how much color there is and where it belongs. They carry this information with them.

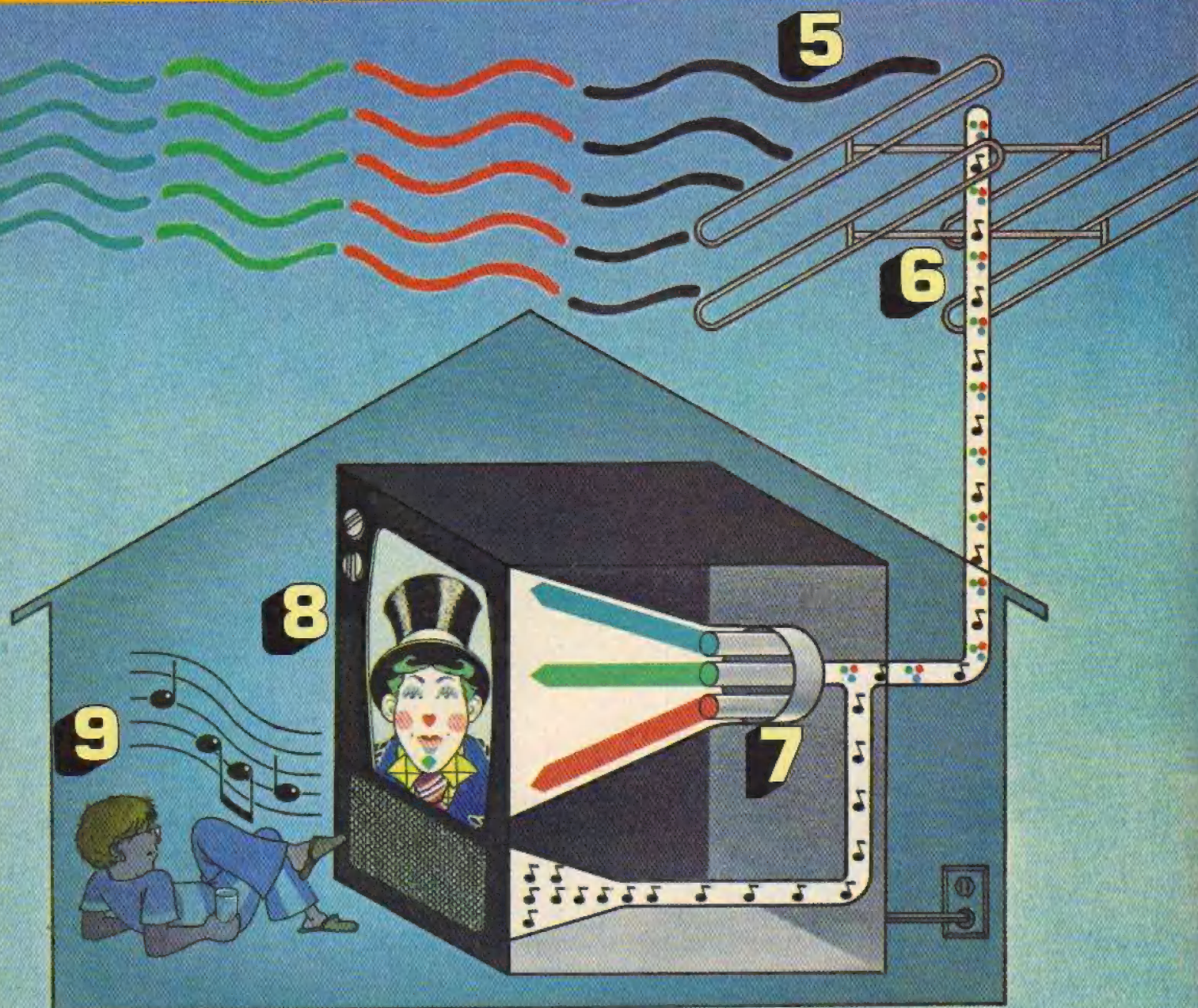
step 4

An electric signal leaves the TV station. Usually this doesn't happen right

away. A show can be recorded by a camera and saved for another day. But let's say this show is being sent out right as it is happening. Electrons travel along wires to the TV station's antenna. Their message is then sent out into the air on a kind of electric signal, called an *electromagnetic wave*. You can't see these signals, but they are all around you.

step 5

The down's electric signals reach the TV antenna on your roof. These electric signals travel so fast that they reach your roof an instant after they have left the TV station. Don't give up yet! There's more on the next page.



step 6

The electric signals hit the electrons in your TV antenna. These electrons pick up the signal. They travel down your antenna and into your TV set. When you turn to a station, you block out all other signals and prepare the way for our clown's entrance.

step 7

Your set unscrambles the picture. Your color TV set is a lot like the camera that began this whole story. Inside are three more electron guns. They are waiting to receive the message of the electrons that traveled down your TV antenna. These guns are aimed at the inside of your TV screen.

step 8

The electron guns shoot the electrons and they hit your TV screen. The screen is covered with a special paint that gets bright when electrons hit it. This screen has thousands of tiny red, blue and green dots that are too small to see. The red gun hits the red dots, the blue gun hits the blue dots and the green hits the green dots. When an electron hits a dot, it lights up. The colors mix in just the right amounts and the clown appears.

step 9

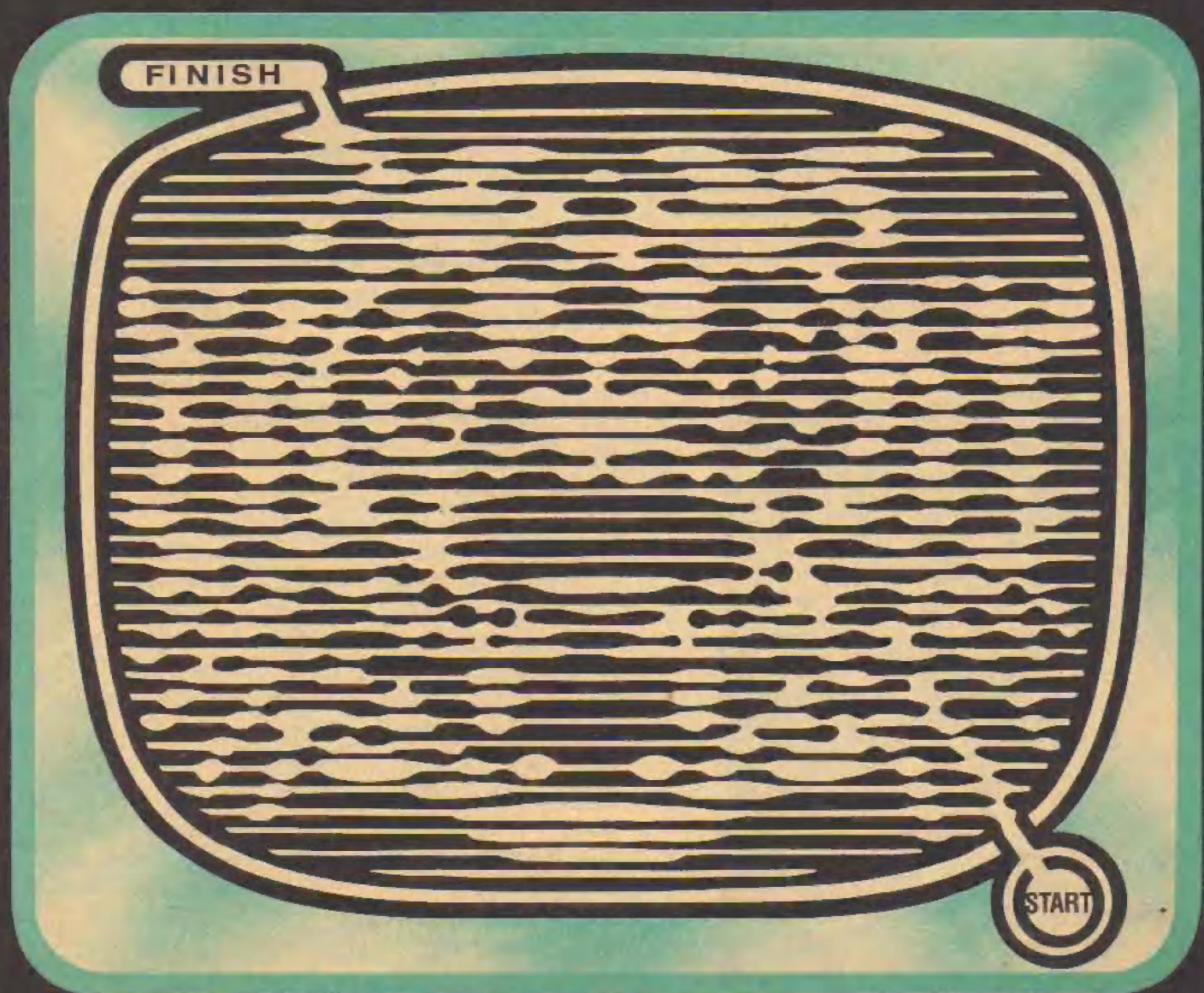
There you have it! The music from the clown's music box, on another electric signal, travels with the picture signal. They arrive on time and you're set for an evening of TV.

TV MAZE

This page is a little like your TV set. From a few feet away, you can see a picture. But if you look closely, you see the picture is nothing but a bunch of lines.

This picture is also a maze. Can you get from the top of the TV screen to the bottom? You must stay in the white spaces.

Answer on page 46.



What Next, White Frogs?

Say the words "polar bear" and you think "white." But if you take a trip to the San Diego Zoo, you had better think again. Several of the bears there have been turning green!

It started happening a few years ago. No one paid much attention at first. They thought the bears were just dirty. If you can get grass stains on you, why couldn't a bear?

Last spring, scientists decided to take a closer look at the grass-colored bears. They discovered that algae (AL-jee), a tiny green sea plant, was living in the bears' hair. This kind of algae grows in fresh water. The bears must have picked it up while swimming in the pools in their cages. With plenty of sunlight reaching the algae, it kept growing and growing.

At first, scientists planned to give the bears a saltwater bath. This would kill the algae and turn the bears white again. But the algae doesn't hurt the bears. And people seem to like the zoo's new attraction. So for now, they are letting the bears keep their new color.



It's not unbearable being green.



A grapevine at home in its test tube.

What's Purple and Lives in a Test Tube?

A whole vineyard has been created from a tiny piece of one grape. Scientist William R. Krul did it with a new method called *cloning*.

Dr. Krul took one little cell from a grapevine's stem and put it in a test tube. The test tube contained plant food, sugar and vitamins. There was also a special chemical to make the new vine grow.

Why would anyone want to grow grapes this way? For one thing, you can keep disease from being passed down from one plant to the next. Also, it takes normal vines three years before they grow grapes ready for picking. Test tube grapes are ready in one year.

So far, growing fruit and vegetables this way is just an experiment. But someday, who knows? In addition to grapes, there are also test tube carrots and test tube asparagus. And when test tube spinach comes along, even if it doesn't make you very happy, Popeye will have something to smile about.

Report

Turn Down the Sun, I'm Freezing

Did you ever think that the sun's heat could cool you off? It sounds a little crazy, but it's true. Scientists have designed an air conditioner that runs on the sun's energy. About 40 of these solar-powered air conditioners are being tested in buildings across the country.

Inside the air conditioner is liquid. This liquid absorbs energy from the sun. This energy then makes the air conditioner's motor work, the same way electricity does in a "regular" air conditioner.

On sunny days, the system produces extra power. This can be used to run the air conditioner when the sun isn't out. Extra energy can also provide power to run other machines around the home. It can even be sent to the power company so that as little energy as possible will be wasted.



Workers inspect a solar-powered air conditioner.



The proud discoverer of Comet Machholz.

His Name in Lights Night after night, Don Machholz searched the starry sky. At last he found what he was looking for. He saw a comet he could call his own.

Don got his first telescope when he was 13 years old. He has been hooked on star gazing ever since.

One night last year, Don took his telescope up into the mountains. In the sky he saw a tiny speck of light. It was not on any of his sky charts. It turned out to be an unknown comet.

Don reported his discovery to the International Astronomical Union, which named the comet for him. It's called Comet Machholz 1978L. Don also received a \$250 reward.

It takes some luck to find a new comet. But it happens more often than you might think. Comet Machholz was the twelfth comet discovered last year. So, if you're a star gazer, keep your eyes peeled. Your name may go down in history, too.

What's that? Have you seen a story in a newspaper or magazine that belongs in the Contact Report? Why not clip it and send it to us? Be sure to include your name, age, address, and the place you found your story. Send it to:

The Contact Report
3-2-1 CONTACT
P.O. Box 2935
Boulder, Colorado 80322

List of the Month Winter Wows

In most parts of the world, winter is an extreme season. So, in honor of winter this year, we've chosen some of those extremes, like . . .

The Best Thing About Winter: People think better in the cold! When it is cooler, claims Dr. Vojin Popovic, the brain "can learn to do everything better and faster than when it is warm." In fact, researchers have found that people are most forgetful and have more car accidents when it's hot and humid.

The Worst Thing About

Winter: Anybody who lived in Buffalo, N.Y. in January, 1977, would agree—it's a blizzard. A snowstorm is officially called a blizzard when the wind is 35 m.p.h., the temperature is 20°F or less, and you can't see farther than a quarter of a mile. With 126 inches (3.2 m.) of snow in 31 days, Buffalo didn't have to wonder if it had a blizzard!



The Most Daring

Winter Activity: Without a doubt, it's hibernation. Bears, chipmunks, snails, bats, squirrels, caterpillars and other animals all spend their winters sleeping. Their heartbeat and breathing slow down. They live off the food they ate or gathered during the fall. Then when warm weather returns, they spring back into action.



The Coldest Place

on Earth: The prize goes to Vostok, Antarctica, where shivering hands recorded a temperature of -126.9°F (-88°C). Now, if you want to live someplace cold, you could go to the city of Ulan Bator, Mongolia. Over the year its average temperature is only 24.8°F (-4.3°C). That's ten degrees colder than living in your refrigerator.



The Warmest Thing

To Wear: A heavy fur coat, right? Wrong! You'll stay toastiest in a few layers of light clothing and a hat covering your head. Warm air will be trapped between the layers, and keep you warm. If you're dressed this way, less than three pounds of clothing will keep you warm in minus 65°F weather!



The Second Best Thing About Winter:

Ice Skating! But it really should be called water skating, since skates need a bit of melted ice to zip along nicely. That's why ice skates are made with thin blades. A skater's weight puts tremendous pressure on the blade. This causes friction, and melts a tiny bit of ice. It helps put glide in every skater's stride.



The Dumbest Winter

Sport: It goes on all over the world. Groups of men and women jump into freezing rivers, lakes and oceans in the middle of winter. Why? "To keep in shape," they say. They're members of something called The Polar Bear Club. Most people have another name for them—"crazy."



The Coldest Place

Anywhere: It's known as Out There, or the Universe. The stars are very hot, but those long, dark stretches between them can get awfully cold, down to a mildly chilly -459.69°F (-273°C). Button up, you aliens!

—Written By
Ellen Weiss



Any Questions ?

What's the difference between an iceberg and a glacier?

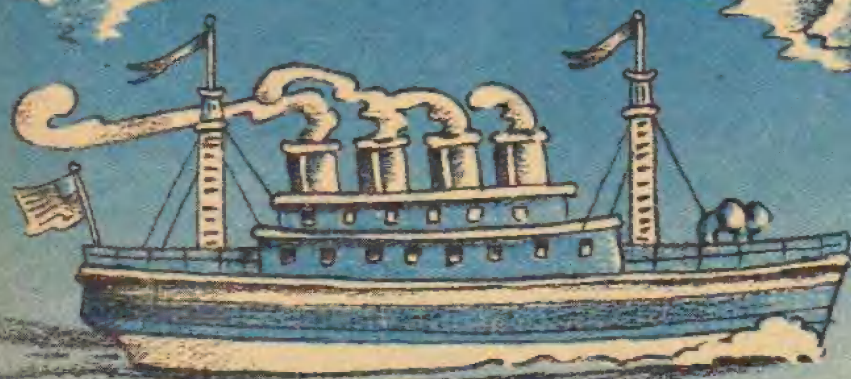
Maybe it's hard to think of icebergs as little, but compared to glaciers they are. You could almost call icebergs "baby glaciers."

Glaciers are gigantic pieces of ice that move slowly over land. They usually move from three inches to six feet a day. But some have been known to move as fast as 200 feet a day!

Once they get moving, glaciers don't let much get in their way. They can carve out valleys, form waterfalls and make lakes. When glaciers run out of land to move over, giant pieces break off. They fall into the ocean and form icebergs. This process is called "calving."

You can only see about 1/9th of an iceberg above the water. (Prove this yourself. Drop an ice cube in a glass of water. About how much of this mini-iceberg can you see above the water?)

It's the giant hidden part that makes icebergs dangerous, as the unlucky ocean liner Titanic found out in 1912. Since that boat was shipwrecked, scientists have kept track of all icebergs. Whew!



How do boats float?

Try this the next time you're splashing around in the tub. Take a piece of aluminum foil and shape it like a boat. When you put it in the water, it floats. Now take the same piece and scrunch it into a tight little ball. It weighs the same, but it sinks like a rock.

So it's not just how much something weighs that makes it sink or swim. It's also how tightly it's packed. Scientists call this density.

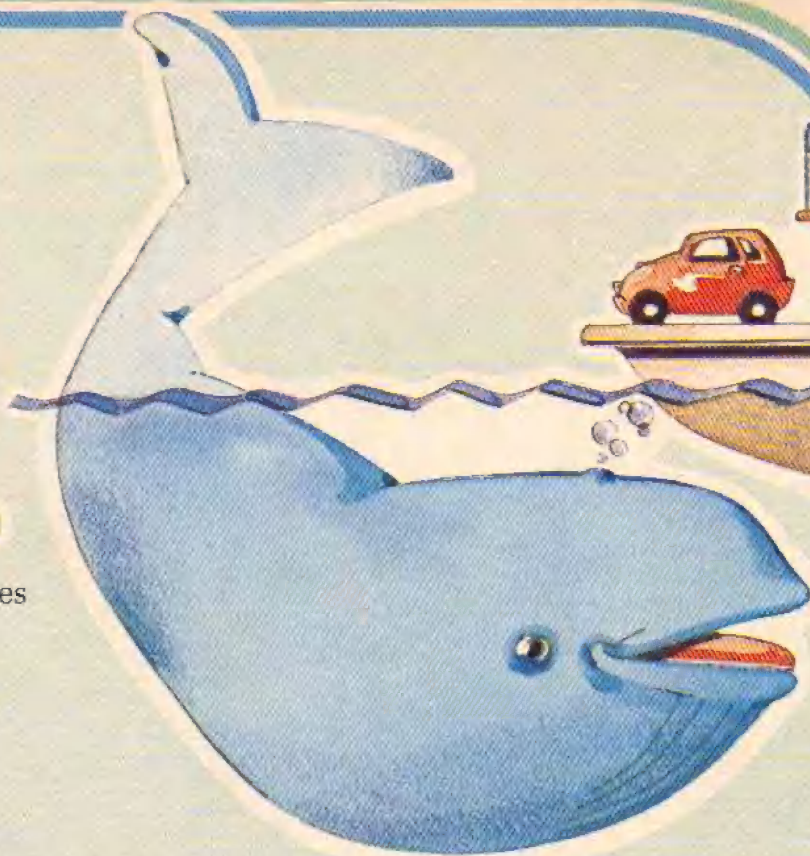
When a boat is in the water, it pushes down. At

the same time the water is pushing back, trying to hold it up. If the water is pushing more, the boat floats. That's why your aluminum boat stayed up. It's weight was spread out. The water could hold it up.

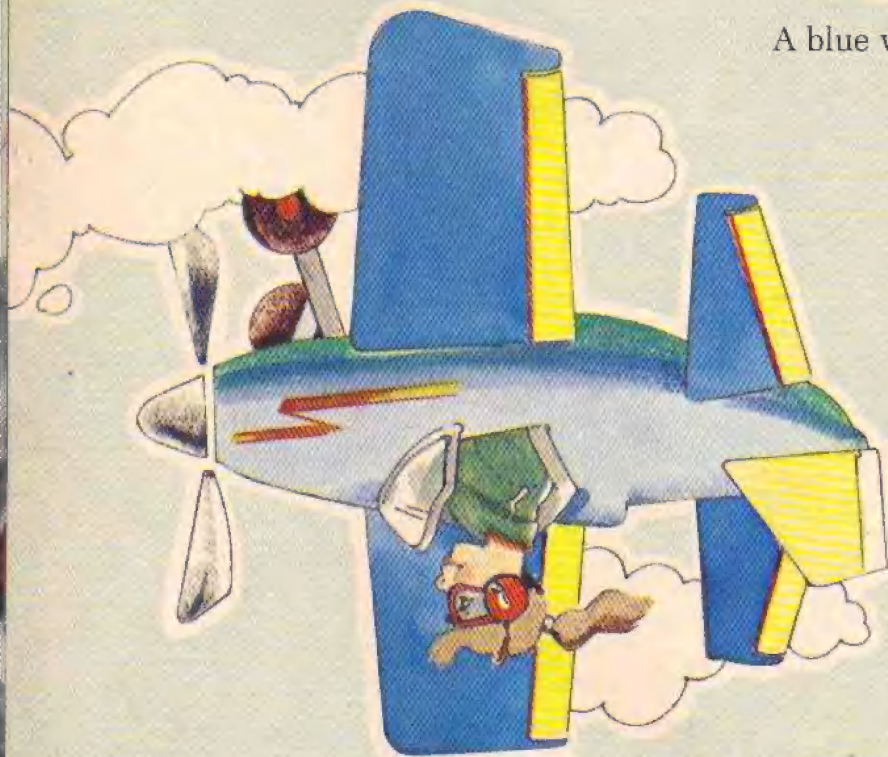
Just about anything can be made to float. Giant supertankers are made of steel. Filled with oil, they weigh hundreds of thousands of tons. But because they are spread out across so much water, they still float. Amazing!



More than 27 billion potatoes were grown in Idaho in a single year.



A blue whale's tongue is as long as a small car.



The youngest pilot to fly alone was Betty Bennett. She was 10 years old at the time.



The largest pancake ever flipped was four feet, nine inches (1.4 m.) across.

SUNDAY

MONDAY

TUESDAY

WEDNESDAY

Earth Days

Febru

3

Elizabeth Blackwell,
first female doctor
in England, is born.
(1821)



4

Happy Birthday,
Charles A. Lindbergh,
famous airplane
pilot. (1902)

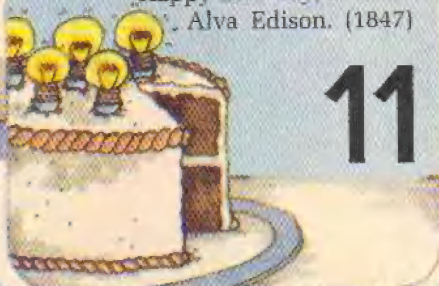
It's Weatherman's Day,
honoring the birth of
John Jeffries, early
American weatherman.
(1744)

5



10

Happy Birthday, Thomas
Alva Edison. (1847)



11

12



17

First American
street lights go
on in Baltimore, Md.
They are gas
burning. (1817)



The planet Pluto
is sighted by
telescope for the
first time.
(1930)

18



19

John Glenn
Day, in
honor of
the first
American
astronaut
to orbit the earth
(1962)

W.S. Otis patents
the steam shovel.
(1839)



24

25

26

27

January

1

Thomas Edison builds the first movie studio. It costs about \$637. (1893)

Thomas Edison builds the first

Thomas Edison

2

Happy Ground Hog Day, all you woodchucks out there.



7

David Donahue and Jolin Cartwright drop an egg 600 feet...

8

... without breaking it—a record! (1974)



9

Happy Valentine's Day.

14



15

Birthday of famous astronomer Galileo Galilei. (1564)



16



21

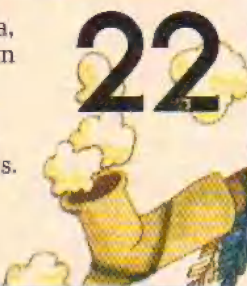
The Washington Monument is dedicated. (1885)

20



22

Quadequina, an American Indian, introduces popcorn to the colonists. (1630)



23

28



Wait a minute! Don't go on to March just yet! It's leap year.

29



Double Talk

When they talk, it almost sounds like two birds chirping.

"Cabengo padem manibadu peetu," Gracy says.

"Doan nee bada tengkmatt," Ginny replies.

As usual, Gracy is in control of the conversation. Grace and Virginia Kennedy are twins. But Gracy has always been the more talkative of the two nine-year-old girls.

"Poto," Ginny says. "Pinit."

"Pinit?" Gracy questions.

"Yah," Ginny insists.

The language that these two girls are speaking is special. They invented it. No one else in the world speaks or understands it. "We knew the girls had nicknames for each other," explains their mother. "Gracy was called 'Poto,' and Ginny was 'Cabengo'. We thought all their other chatter was baby talk. We didn't realize that they could really understand each other."



Gracy and Ginny were born in Columbus, Georgia, in 1970. Their parents were not expecting twins. It took time for them to find money for all the things their babies needed. At first, the two girls shared everything, even the crib that they slept in. It was six months before each girl had a bed of her own.

As they got older, the girls remained best



Double

Talk

NINE-YEAR-OLD TWINS INVENT A LANGUAGE

By Diane O'Brien



friends. The neighborhood where they lived had very few children. And so, the twins relied on each other for company. They spent their days playing together, chattering in their special way.

During the day, Gracy and Ginny heard almost no English. Both of their parents worked. Their grandmother was their babysitter, and she spoke only German. When the girls had to talk to her, they used hand signals, or a few simple words.

Their only chance to speak English came at



night, when their parents came home. But Ginny and Gracy were only able to talk in simple phrases. They would say things like "want water" and "me juice."

Mr. and Mrs. Kennedy were worried. They felt their daughters needed help. It was time for the twins to start school. But how could they go to school if no one could understand what they were saying? And so, when the girls were six years old, their parents took them to a special children's hospital for help.

At the hospital the girls met Alexa Romain and Ann Koeneke. They were speech therapists, scientists who help people correct speech problems. They listened to the girls for a short amount of time and thought they knew what the problem was. Gracy and Ginny were using something called twin speech.



Left to Right: Therapist Alexa Romain, Gracy Kennedy, Ginny Kennedy, and therapist Ann Koenke.

Twin speech happens when twins, or very close brothers and sisters, make up a private way of talking with each other. Usually it goes away by the time twins are three years old. Then they learn to speak the same way all children do. They copy the way their parents and their older brothers and sisters talk. In the case of Ginny and Gracy, this did not happen. Instead of learning English, they turned their baby talk into a whole language.

Scientists are not completely sure why this happened. Most likely Gracy and Ginny's life at home had a lot to do with it. They did not learn much of the German their grandmother spoke. The girls' parents did not keep correcting their way of speaking. And since there were no other kids in the family, they did not hear lots of English during the day.

Solving the Problem

To help Gracy and Ginny, the speech therapists studied the way they spoke. Alexa and Ann began to understand more and more of what the twins were saying. "Gimma" meant camper. "Dine" meant pen. "Pinit" meant finished. Some of the words, the therapists realized, are like English ones. (Pinit sounds a lot like finished.) Other words seemed to be like German ones. These must have come from listening to their grandmother. Many of the other words were harder to figure out.

The therapists began to work with Gracy and Ginny. They had several goals for the girls. They wanted them to learn more English words. They

wanted them to understand more of what people around them were saying. And they wanted the girls to speak their private language with them—slowly. That way, Alexa and Ann thought, they would come to understand the twins' language.

Alexa and Ann see the twins three times a week. Each time the twins have a one-hour language lesson. Ginny and Gracy get separate lessons. This way, they are less likely to use their own language, and more likely to learn English.

The lessons are working. Today, the girls are nine years old. They go to regular school, but are in a class for kids who have special language problems. Tests show that they are not yet speaking as well as most nine-year-olds do. But they are catching up fast.

As scientists study Gracy and Ginny's language, they are also learning. They hope to use it to figure out more about the way that all people learn to speak.

The twins have learned a lot since they began their speech therapy. But learning how to speak was only one of the goals set for the girls. Their therapists wanted to make sure that Gracy and Ginny kept their self-confidence as they learned. And they wanted to be sure that the girls realized that their twin speech was not something strange. It was something very special. **==**

What does Gracy and Ginny's twin talk sound like? Sometimes, it's very strange, like this sentence: "Dug-on, haus you dinikin, du-ah." No one knows exactly what that means.

Here is a list of some words that have been translated from the Kennedy twins' special language into English.

Cub ubs cabee	Cup of coffee
Ho-anks	The color orange
Hok-skay	Okay
How	House
Lellow.....	Yellow
Montu.....	Monster
Neeps	Knife
Paytoo.....	Feather
Pintu	Pencil
Shuvoo	Shovel
Sihzoo.....	Scissors
Tah	Salad

A Little More About Twins

Alan has grey eyes and black hair. Suzy has green eyes and brown hair. Alan is tall, while Suzy is short. But Alan and Suzy are twins.

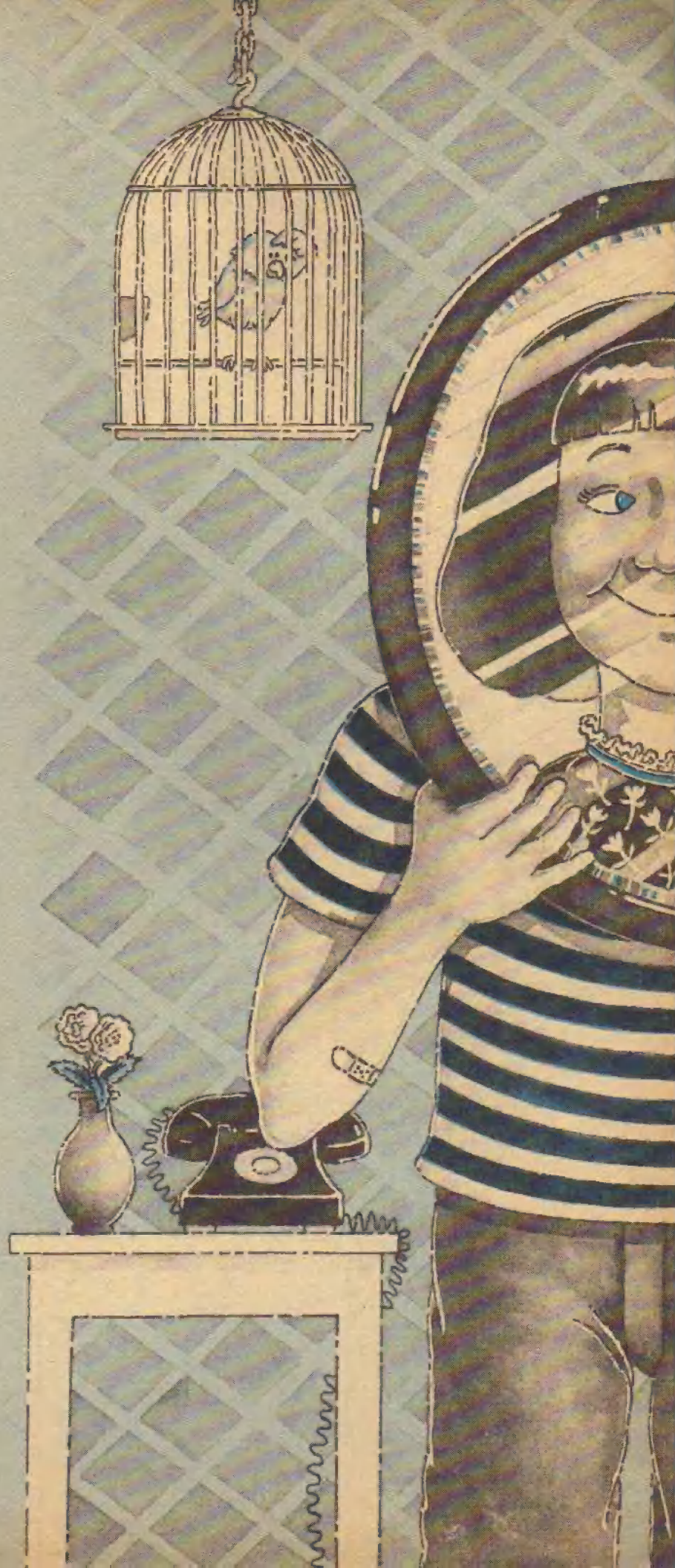
Does that sound impossible? It's not. Not all twins look as much alike as Gracy and Ginny Kennedy, the twins in the "Double Talk" story.

Twins are any two children born at the same time to the same mother. They may be two sisters, two brothers, or a sister and a brother.

Identical twins, like the Kennedy girls, look alike and are always of the same sex. They must have the same color eyes and hair.

Fraternal twins can be two kids of the same sex, or two kids of different sexes. They are often alike in many ways, but they can look al-

Can you figure out this picture of twins? Turn the page.



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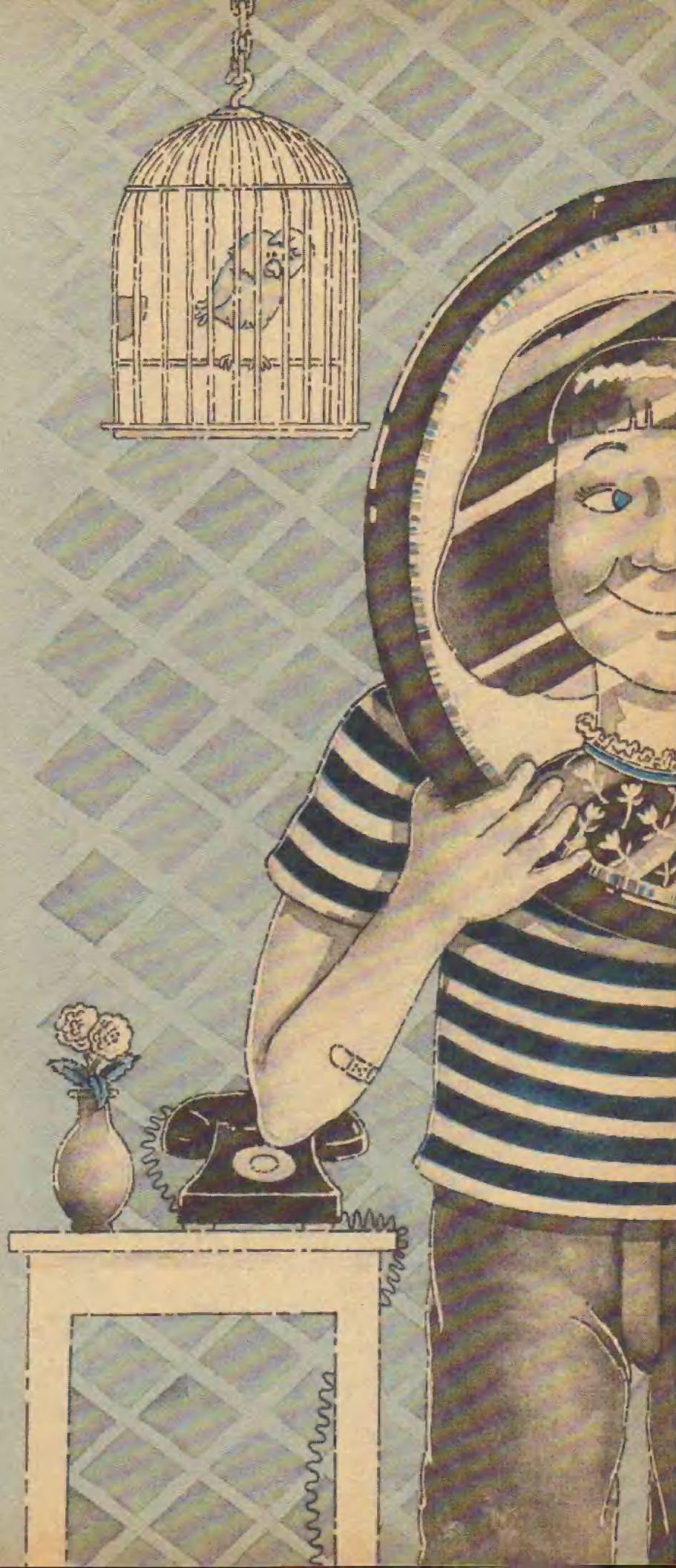
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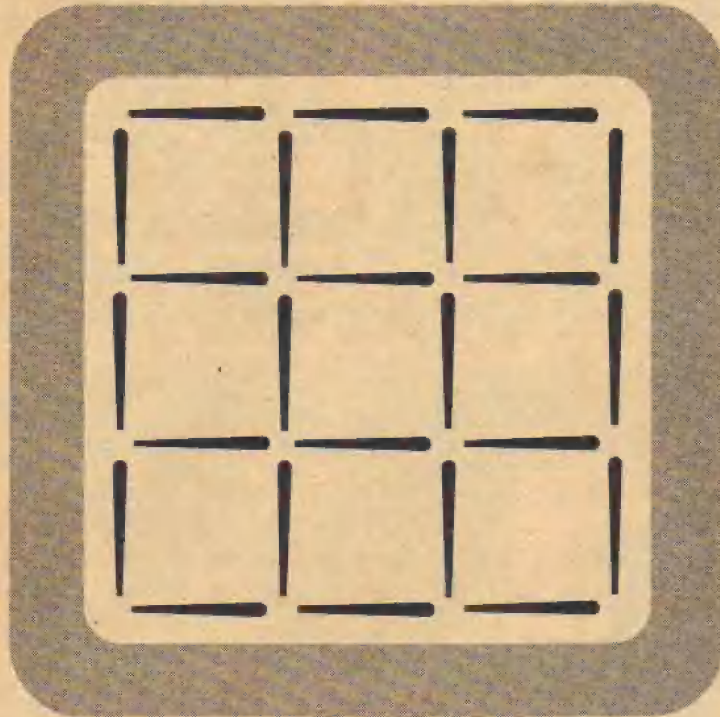
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Can you figure out this picture of twins? Turn the page.



Toothpick Tricks



1. Set up toothpicks so there are nine squares, as in the picture on the left. Now take away eight of the toothpicks, so that there are only two squares left.

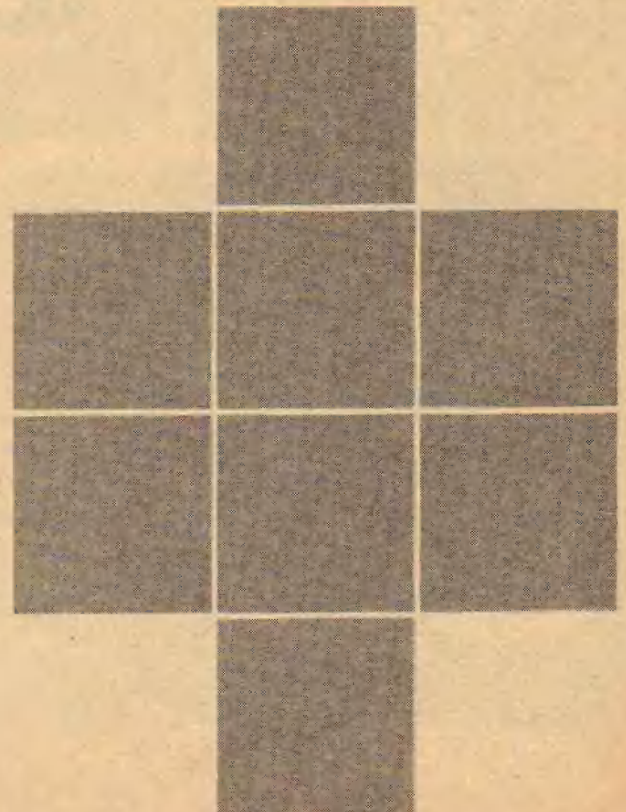
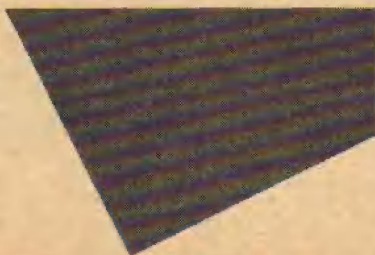
2. Okay so you got #1. How about this one? Line up six toothpicks, as in the picture below. Now add five more to make nine.



Puzzles for Squares

3. On the right are eight squares. Write the numbers 1, 2, 3, 4, 5, 6, 7 and 8, one in each box. You must do it so that no two numbers that follow each other (like 3 and 4, or 8 and 7) are in boxes that are next to each other. They can't even be in boxes that only meet at one corner.

4. Cut out the shape below. Trace it and make three more just like it. Now fit them together so that they make one square. Don't give up so fast. It can be done.



Reviews & Previews

Movie: What happens when a regular person starts to think he's a superhero—and people believe him? That's the question in *Hero At Large*. This comedy stars John Ritter, from *Three's Company*. It will be opening in movie theaters all over the country in February.



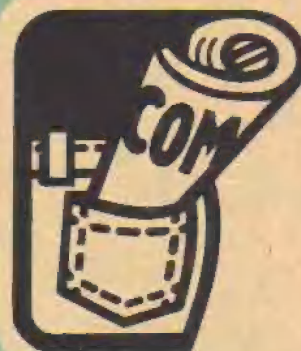
Book: Now that you know how boats float, you're ready for bigger and better things—like how submarines can travel through our oceans and rivers. Or maybe you'd like to try some experiments that will show how a boat floats and doesn't tip over. You can, if you read *What Makes a Boat Float?*, written by Scott Corbett and published by Little, Brown and Company.



Book: On page 18 we told you about icebergs. But there is a lot of neat information we didn't have room for. Did you know when an iceberg melts, it fizzes like soda pop? Look for *Iceberg Alley* by Madeline Klein Anderson, published by Messner. It has amazing pictures and facts on those oversized icecubes.



Comic Book: Do you have a favorite Superman or Batman story? You might be able to find it in the *Best of DC*. It's a special issue of books that DC Comics is publishing. The February issue will reprint 10 of the best comic stories of last year. This small size book costs 95¢. Just check your newsstand for your own super-copy.



Something Free:

Now you know how television works, but do you know the best ways to watch TV? For instance, did you know you should not watch TV in a dark room? For tips on watching television and TV safety, send for the booklet "Television and your eyes."

Write to:

National Society
to Prevent Blindness
79 Madison Avenue
New York, N.Y. 10016



Museum: The ships of Nantucket Island once sailed all over the world searching for whales. Though they stopped hunting whales 100 years ago, you can still learn about life on a whaleboat at the Nantucket Whaling Museum.

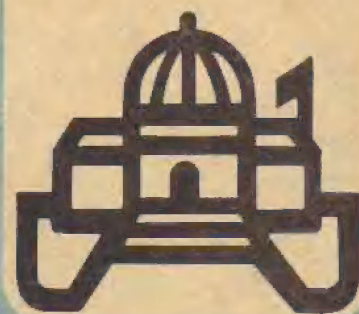
A visitor there will find hammers and clothespins carved out of whalebone. She can see pictures and stories

(continued below)



Something Free: On February 22, 1630, the American colonists first learned about popcorn. The anniversary of that special day calls for a celebration. Create popcorn clowns or popcorn hats and invite some friends over. Find out how to make these and other popular recipes in *Popcorn is Fun for the Whole Family*. Write to:

American Popcorn
Company
Sioux City, Iowa 51102



TV Show: *The Martian Chronicles* is a great science fiction book by Ray Bradbury. It is about the first human beings to live on Mars. Next month, it will be on TV for three nights as a six-hour miniseries. Watch for it on NBC.



about ocean adventures. And she can find out how important it is to save whales before they become extinct.

This museum is in Massachusetts. If you can't get to see it, visit one near you. Send a 100 word report to us about it. We will print as many of these as we can. Send it to:

Reviews & Previews
3-2-1 Contact
P.O. Box 2935
Boulder, Colorado 80322

Timeline



Peter Henlein and his waist-watch.

The History of Watches

Past

The first watch was invented in 1510 by Peter Henlein, a 30-year-old German lock maker. In his spare time, Henlein built a timepiece that could keep ticking without using big, heavy weights, the way clocks did. Though his watch was smaller, it wasn't tiny. In fact, it was so big it had to be worn on a belt around the waist. It was really a waist-watch!

Peter was proud of his new invention. He made a fancy metal case for it. The face of the watch was fancy, too—it had Roman numerals

(I, II, III) and Arabic numbers (1, 2, 3).

This watch would keep going for 40 hours. There was only one problem. Peter's watch had only one hand. You knew the hour, but you had no idea how many minutes were left in it.

By 1700, watches had become very popular. Inventors kept making them smaller, and even added a minute hand. But it wasn't until 1790 that anyone put time on people's hands.

That year, a rich woman asked two Swiss watchmakers to have her watch "fixed as a bracelet." When she returned, they presented her with the world's first wristwatch!

Present

Today, wristwatches do more than just tell time. They are really like little computers. Some tell you the day and month. Others have little alarm buzzers to keep you from being late. There are even calculator watches which can add, subtract, multiply and divide, all in a matter of seconds.

Many watch faces look different than they did in Peter Henlein's time. *Digital* watches have done away with both the minute and the hour

hand—now numbers flash with the up-to-the-second time.

Watches don't have to be wound any more. Some run on tiny batteries that last up to two years. Some wind themselves up whenever your arm moves. And there's one watch that even uses atomic energy from a little piece of metal. It is guaranteed to run for 12 years without needing winding.

Timeline



This modern watch is also a calculator.

Timeline

Future

Only time will tell what the watches of the future will do. They may have speakers and be used for telephone-type conversations. They may have little television screens, or be able to predict the weather. They may even include tiny talking computers, ready with millions of pieces of information.


What do you think the watch of the future will look like? Design your future watch here. Be

sure to write down what it does. Then send it along with your name and address to:

Timeline
3-2-1 Contact
P.O. Box 2935
Boulder, Colorado 80322

We will print our favorites in a future issue.

—Written By Michael Musto



A Star Is Born

THE LIFE CYCLE OF THE SUN

By Douglas Colligan

Stars, like people, are born. And, like people, they grow old and die. But unlike people, stars can live for billions of years. Our sun, a medium-sized star, is already five billion years old. It will probably last another five billion years before it dies. But it will die. Why? Because like all stars, it is a sort of nuclear fire that will one day run out of fuel. How will it die? It will go through different steps. On these pages, you'll find the way our sun was born and what will happen to it in the future.



The Sun Begins as a Huge Cloud

Scientists believe the sun began as a cloud of gas millions of miles wide. That was over five billion years ago. Bits of this huge cloud started moving closer together. It got hotter and hotter. The closer it moved to the center, the hotter and more tightly packed the cloud became.



2

The Huge Cloud Turns into a Tight Yellow Ball

Over about half a billion years, the material in the cloud kept getting tighter and tighter. Finally, it began burning with a yellowish color. It was a compact ball of fire, now "only" one million miles wide. This is what the sun is today.

3

The Yellow Sun Grows into a Gigantic Red Star

About five billion years from today, the sun's fuel will start to burn low. It will begin to cool off and start to grow. The sun will become incredibly wide, and will burn up Mercury, Venus and Earth. When it stops growing, it will reach out near Mars. The sun's color will have changed, too. It will be known as a red giant.



4


The Gigantic Star Collapses and Changes Color

After about 30 million years as a red giant, the sun will collapse. Like a balloon with the air leaking out, it will become smaller and smaller. Eventually, it will turn into a tiny white-hot star called a *white dwarf*. And it will become very *dense*. This means it will be pressed together in a way that makes every bit of it very heavy. This white dwarf sun will become so dense that a spoonful of it would weigh about a ton!



5

The Sun Ends Its Life as a Black Dwarf

The white dwarf will, after some time, cool off completely. It will leave behind a cinder, like ashes from a fire. This cinder is known as a *black dwarf*. It will have no light or heat of its own. Our sun will be dead. 



Skin

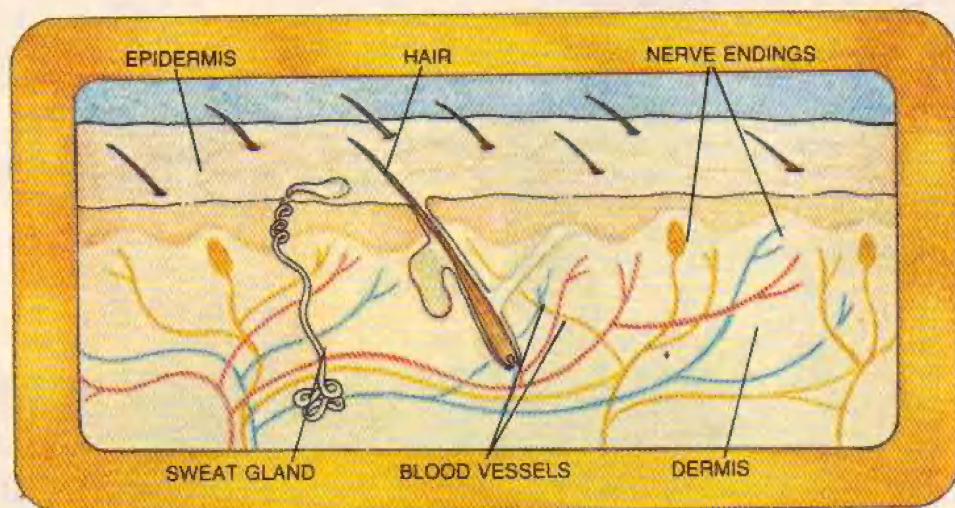
This month *Busy Bodies* covers the stuff that covers you—your skin. Though you don't think much about it, your skin is pretty amazing. You don't believe us? Well, keep reading!

Meet Your Skin

It's time to take a close look at your skin. Using a pen that washes off, make a square on your arm. Each side should be $\frac{3}{4}$ of an inch long. It may not look it, but here's some of what is hiding in the layers of skin in that box:



Thirty hairs.
Nine feet of blood vessels.
Three hundred sweat glands.
Nine thousand nerve endings.



Under Your Skin

Skin is a little like a package of bologna. Why, you ask? Because it's made up of many very thin layers. You can divide these layers into two main groups. On top are the layers of the *epidermis* (ep-uh-DER-miss). This is the skin you see. The epidermis is made up of several layers of old dead skin. If you scratch hard, it will flake right off. In fact, it will flake off even if you don't. Most people will lose about 40 pounds of skin in their lives!

Below the epidermis is the *dermis* (DER-miss). The layers of the dermis are where the real action is. This is where the skin does most of its work. In the dermis, you will find the nerve endings, blood vessels and sweat glands we told you about. It is also where new skin is produced.

Skin's Job

Your skin protects you by keeping dirt and germs outside your body. It's also responsible for your sense of touch. Nerve endings below your skin send messages to your brain. Everything from a kiss on the cheek to a sock in the nose is recorded by the nerve endings and sent in an instant to your brain. The skin on different parts of your body has different numbers of nerve endings. The more nerve endings there are, the easier it is to feel things. There are extra endings in your fingertips for example, where touching comes in extra handy.

Your skin also helps keep your body cool. For more on this, see the experiment on page 42.

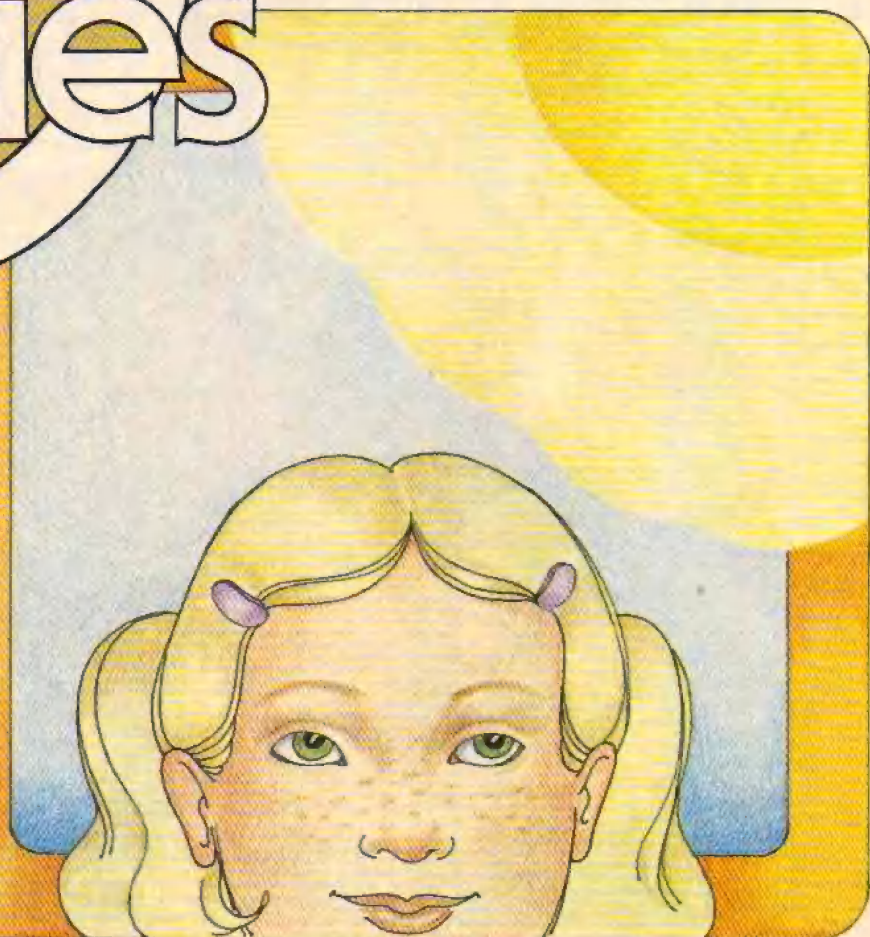


Quiz

Here's a little quiz. See how much you know about your skin. Then check the answers on page 43. You may be surprised.

1. Chocolate gives you pimples. True or false?
2. Poison ivy is always catching. True or false?
3. Health foods are good for your skin. True or false?
4. If you scratch a chicken pox, you will get scars that never go away. True or false?
5. Certain soaps can give you a sunburn. True or false?
6. Eating french fried potatoes will give you pimples. True or false?
7. Warts are catching. True or false?
8. Drinking some sodas will give you a sunburn. True or false?

dies



Skin Color

Why do people have different color skin? The main reason is something called melanin (MEL-uh-nun). This is a dark-brown substance in your skin. It helps protect your skin from harmful rays of the sun that would burn you.

The more melanin in your skin, the darker your skin will be. How much melanin you have is caused by *heredity*. In other words, how much melanin your parents have in their skin decides how much you will have.

Tans and Sunburn

While you are lying on the beach, the sun is covering you with *ultraviolet rays*. To protect itself, your body produces extra melanin. Sometimes this melanin is produced in small blotches. Sounds pretty gross, huh? But these spots of melanin are your freckles.

When your body makes more melanin all over, instead of freckles you get a suntan. If your skin can't make enough melanin, you get sunburn.

Here's a little potion that helps cool off a sunburn. What good is a sunburn potion in the middle of winter? Plenty. It's good for chapped skin and rashes, too.

You Need: a bowl, ice water, milk and salt.

1. Fill a bowl with one half cup ice water and one half cup milk.

2. Add one half tablespoon of salt, and stir.

3. Dab your mixture on your sore skin with a soft, clean cloth. You should start feeling better in no time.

Experiment #1: Your Skin and Touching

All you need for this experiment are two toothpicks and a small ruler.

Hold the toothpicks in one hand. Make sure the points are about one half inch apart. Now poke your arm between your wrist and elbow with the toothpicks. Do this a few times. You know you have two toothpicks in your hand, but it feels like you have only one. Pretty weird. Try it again with the toothpick points one and a half inches apart. This time, you should feel both of them.

In your skin are nerve endings that record pressure. In your arm, they are about $1\frac{1}{2}$ inches apart. That's why you only felt one toothpick the first time. The toothpicks were too close together. They hit the same pressure nerve and felt like one. The second time you hit two different pressure nerves and felt them both.

Try this experiment on your fingertips. Your fingers have more pressure nerves. How close must you put the toothpicks before two feel like one?

Experiment #2: Keeping Cool

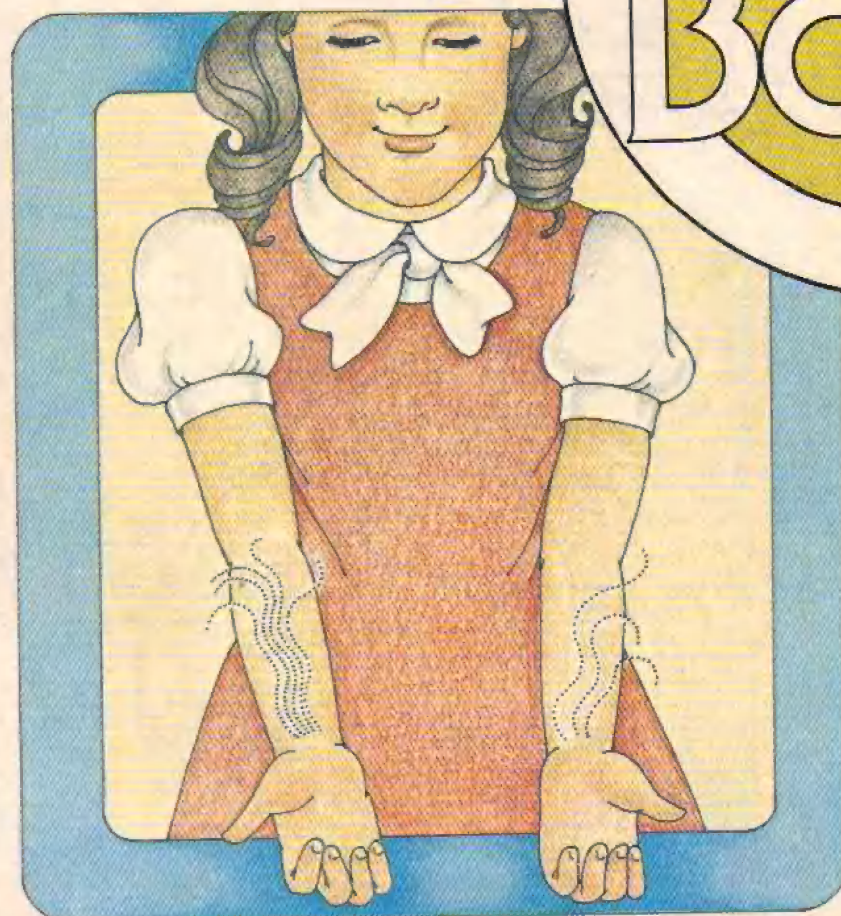
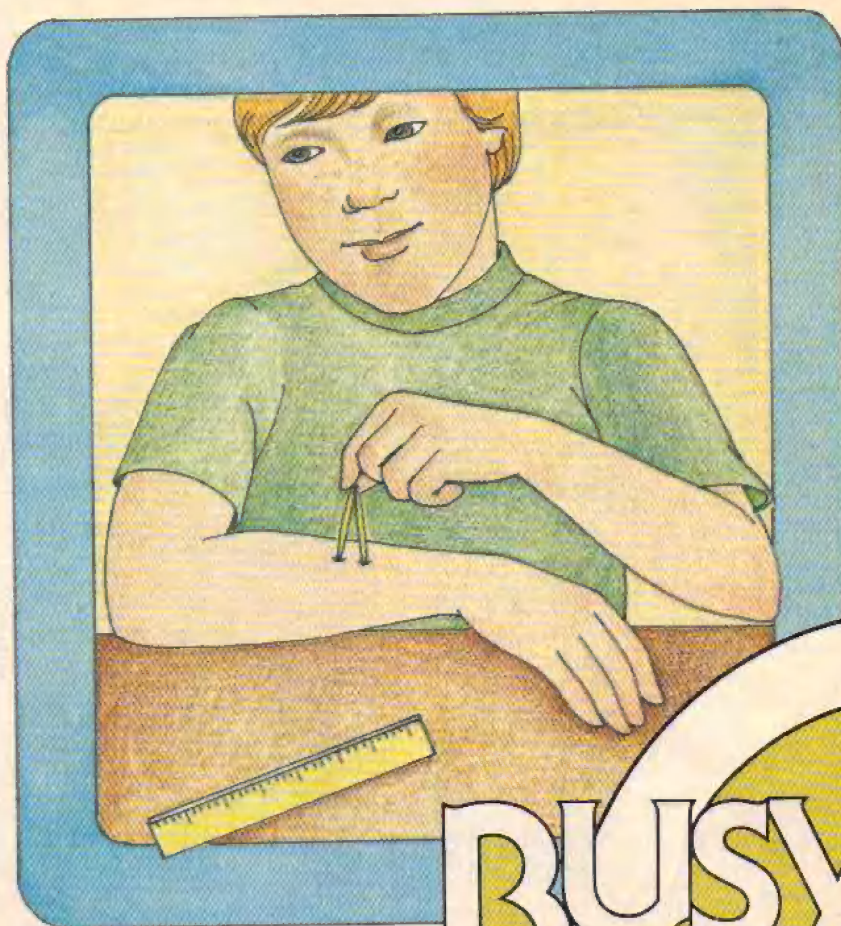
For this experiment you need cotton balls, water and rubbing alcohol.

Dip a cotton ball in water and rub your left wrist with it. How does your wrist feel when the water evaporates?

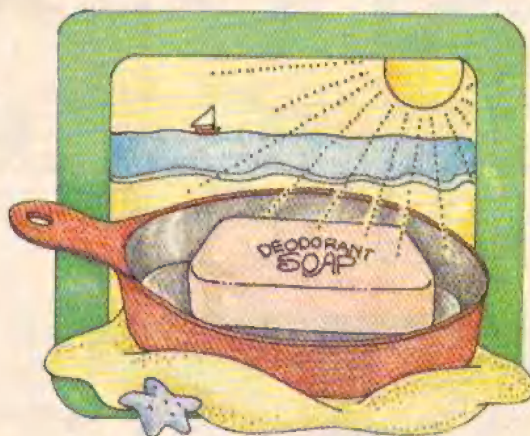
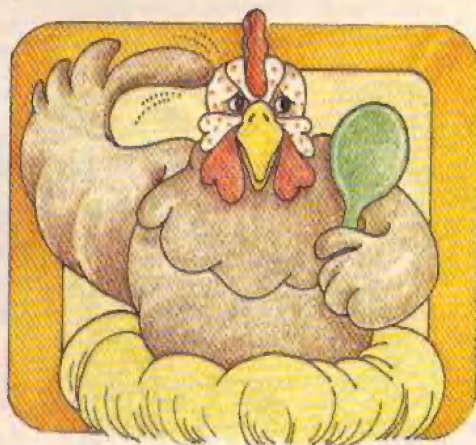
Now dip a second cotton ball in the alcohol. Dab your right wrist with it. How does it feel?

As the water evaporates, it makes your left wrist feel cool. Since alcohol evaporates even faster, your right wrist feels even cooler.

Your skin cools your body the same way. When you get overheated, you start to sweat from your sweat glands. Your sweat is made of salt and water. The sweat that covers your skin then evaporates and your whole body gets cooler.



BUSY
BO



Answers to the Quiz

1. False: Chocolate does not give you pimples. Well, not exactly. Though chocolate is safe, the sugar that almost always goes along with it is not. Sugar is bad for your skin.

2. False: Poison ivy isn't always catching. You get poison ivy from the oil on the poison ivy plant. Once a person washes off all this oil you are safe from her. But there's no way of being sure. And if she wipes the oil off on a towel, you could catch poison ivy from that. And the oil could also be on her clothes. So play it safe and steer clear.

3. True: Many so called "health foods" are bad for your skin. If you have a lot of pimples or acne, stay away from wheat germ, peanuts, sea salt and spinach.

4. False: It takes time, but chicken pox scars do go away. Most of them will disappear in three to five years.

5. True: Some deodorant soaps can make your skin super-sensitive to the sun. Look at your soap label. If the ingredients include "halogenated salicylanilides," be careful at the beach!

6. False: French fries do not cause pimples or acne, though many people think they do.

7. True: Warts are catching. Like colds, they are caused by viruses. If you do get one, don't worry. Like colds, they also go away (though not as fast). By the way, you won't get warts from touching a frog.

8. True: Drinking diet sodas can lead to a sunburn. But then, sodas with sugar could cause pimples. Sometimes you just can't win!

Thanks to dermatologist (skin doctor) Dr. Jonathan Zizmor who helped us put this quiz together.

Crossword Puzzle

A lot of what you need to know to do this crossword can be found in 3-2-1 CONTACT. If you don't know the answer to a clue, look on the page listed after it.

Across

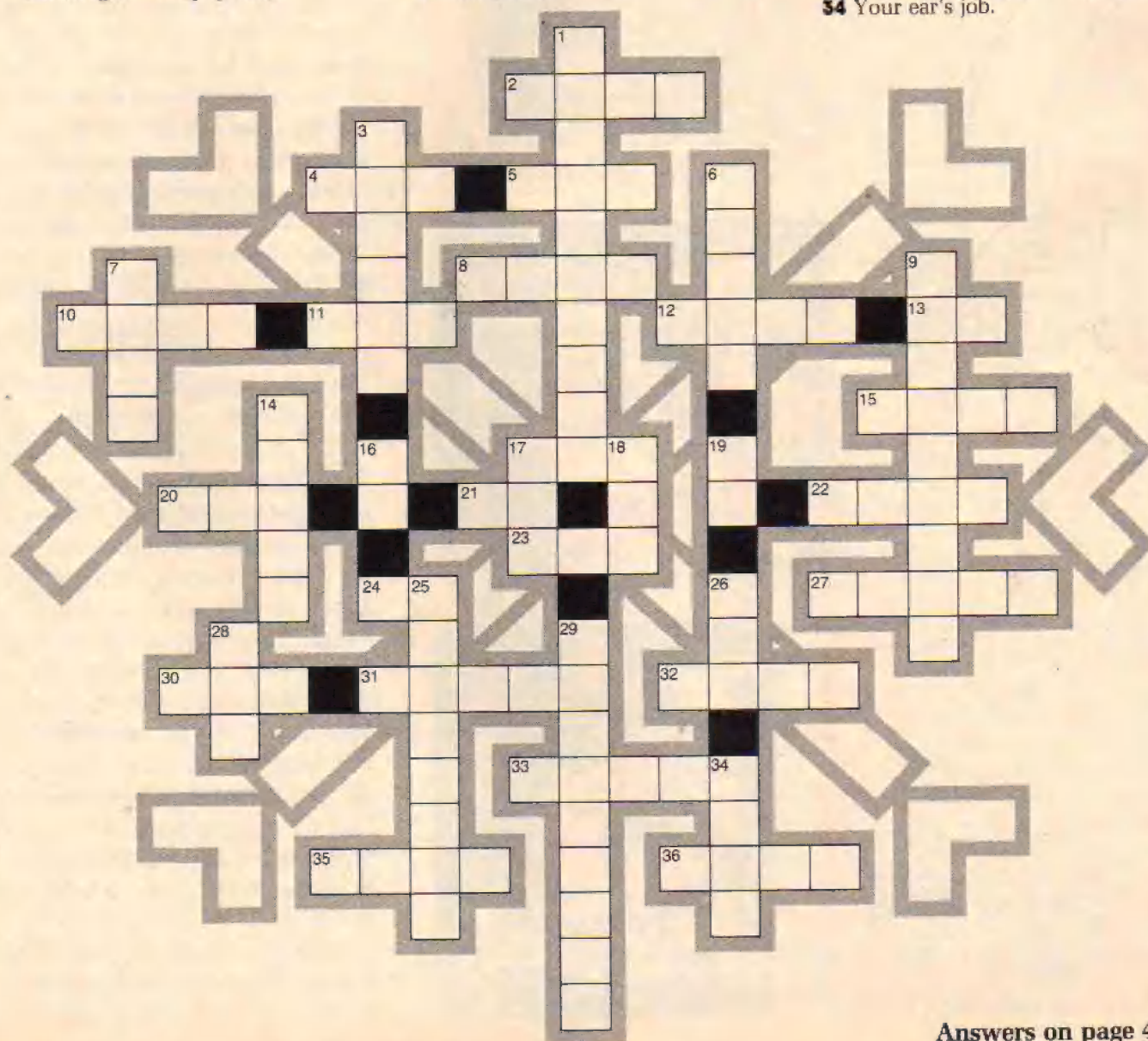
- 2** Thomas ____ Edison, inventor. (page 24)
- 4** You breathe this.
- 5** Frozen water.
- 8** If your belly hurts, you have a stomach ____.
- 10** On February 24, 1839, W.S. ____ invented the steam shovel. (page 24)
- 11** A female chicken.
- 12** In 1977, Buffalo got 128 inches of this white, powdery stuff. (page 16)
- 13** Not out.
- 15** They make honey.
- 17** Smokers use this kind of tray.
- 20** Green polar bears are in the San Diego _____. (page 14)

- 21** Nickname for Edward.
- 22** A game: base ____.
- 23** Look, up in the ____!
- 24** He is, they are, I ____.
- 27** A scarecrow lives in a corn ____.
- 30** Short for laboratory.
- 31** Sound you make when you sneeze.
- 32** It holds your body together. (page 40)
- 33** Peter Henlein invented this. (page 34)
- 35** Pepper and ____.
- 36** A baby cow.

Down

- 1** These are like giant potholes in space. (page 9)
- 3** A baby cat.

- 6** Ginny and Gracy Kennedy are these. (page 26)
- 7** Our sun is one. (page 37)
- 9** They flash on and off. (page 19)
- 14** Dr. Krul's vine is a ____ from a grape cell. (page 14)
- 16** Not yes.
- 17** Short for advertisements.
- 18** This is for horses.
- 19** Not down.
- 25** A comet is named for him: Don _____. (page 15)
- 26** Mork is from here.
- 28** "Salad" in the Kennedy twins' secret language. (page 28)
- 29** It began turning green. (page 14)
- 34** Your ear's job.



Enjoy Sesame Street

For Ages 2-6



Sesame Street Magazine — Big Bird and his delightful friends will bring dozens of playful surprises, ten terrific times a year. (It's the entertaining education that Sesame Street does best!) Puzzles, cut-outs, games, A-B-C's, 1-2-3's... there's all the magic of the TV super-series in every colorful issue.

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8AAB5

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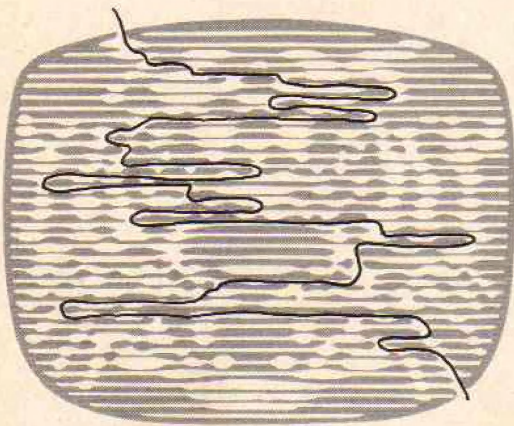
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MAIL TO: The Electric Company Magazine
200 Watt Street, P.O. Box 2925, Boulder, CO 80322

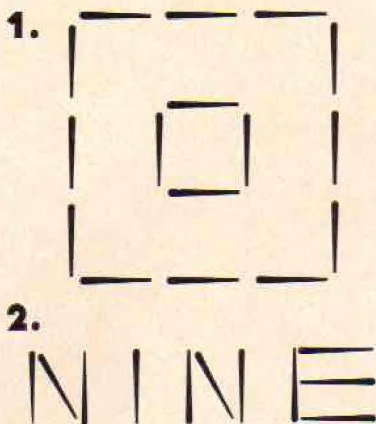
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Answers:

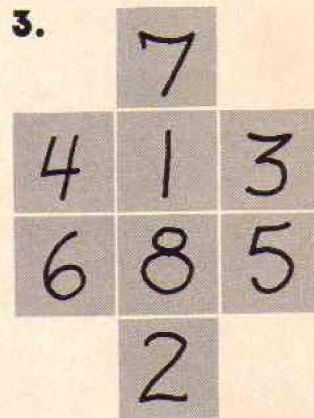
TV Maze (page 13)



Toothpick Tricks (page 31)



Puzzles for Squares (page 31)



Next Month!

Here's a little sample of what you'll find in the next issue of 3-2-1 CONTACT.

Science Fiction

A spectacular look at science fiction in movies that came true.

16 Page Bonus

A special section all about our new television show.

Circus Doctor

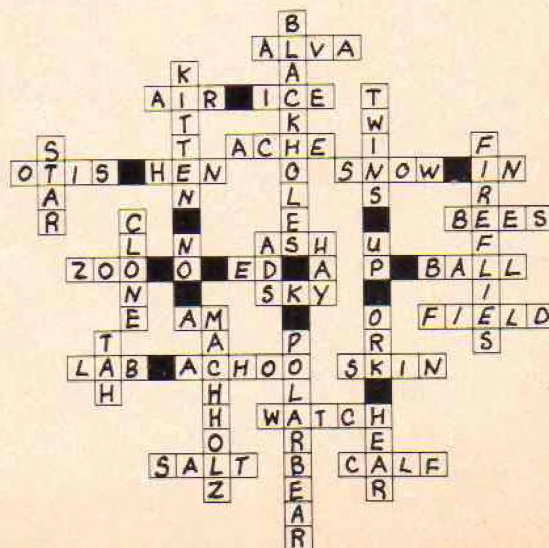
Meet a man whose patients are elephants, tigers and lions.

List of the Month

The most dreadful disasters of all time.

**Plus, Skywatch,
Busy Bodies, Factoids, Puzzles
And Much More!**

Crossword (page 44)



Credits

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Skyfacts: Venus

Each month Skywatch will bring you another close-up look at a planet or moon. Clip these pages and save them in a notebook. At the end of the year, you will have your own guide to the solar system.



Symbol: The planet's symbol (at left) is a hand mirror. Since Venus is the goddess of beauty, this is very fitting.



Size: Venus measures 23,545 miles (37,884 km.) around its equator—about the same size as Earth. It is sometimes called Earth's "twin sister."



Day: It takes 243 Earth days to make one day on Venus!

Year: A year on Venus is shorter than a day. It takes 225 Earth days for Venus to orbit the sun.



Temperature: The surface of Venus is about 900° Fahrenheit (480°C). It is so hot because its thick clouds trap the planet's heat.

Atmosphere: The planet's air is made up mostly of carbon dioxide. And the air moves fast. Venus' winds sometimes whoosh at 200 miles (322 km.) an hour!



Surface: A visitor to Venus would see some amazing things. There is a mountain that is more than a mile taller than the biggest mountain on Earth, Mt. Everest.



Moons: As far as we know, there are no moons orbiting Venus.



You on Venus:

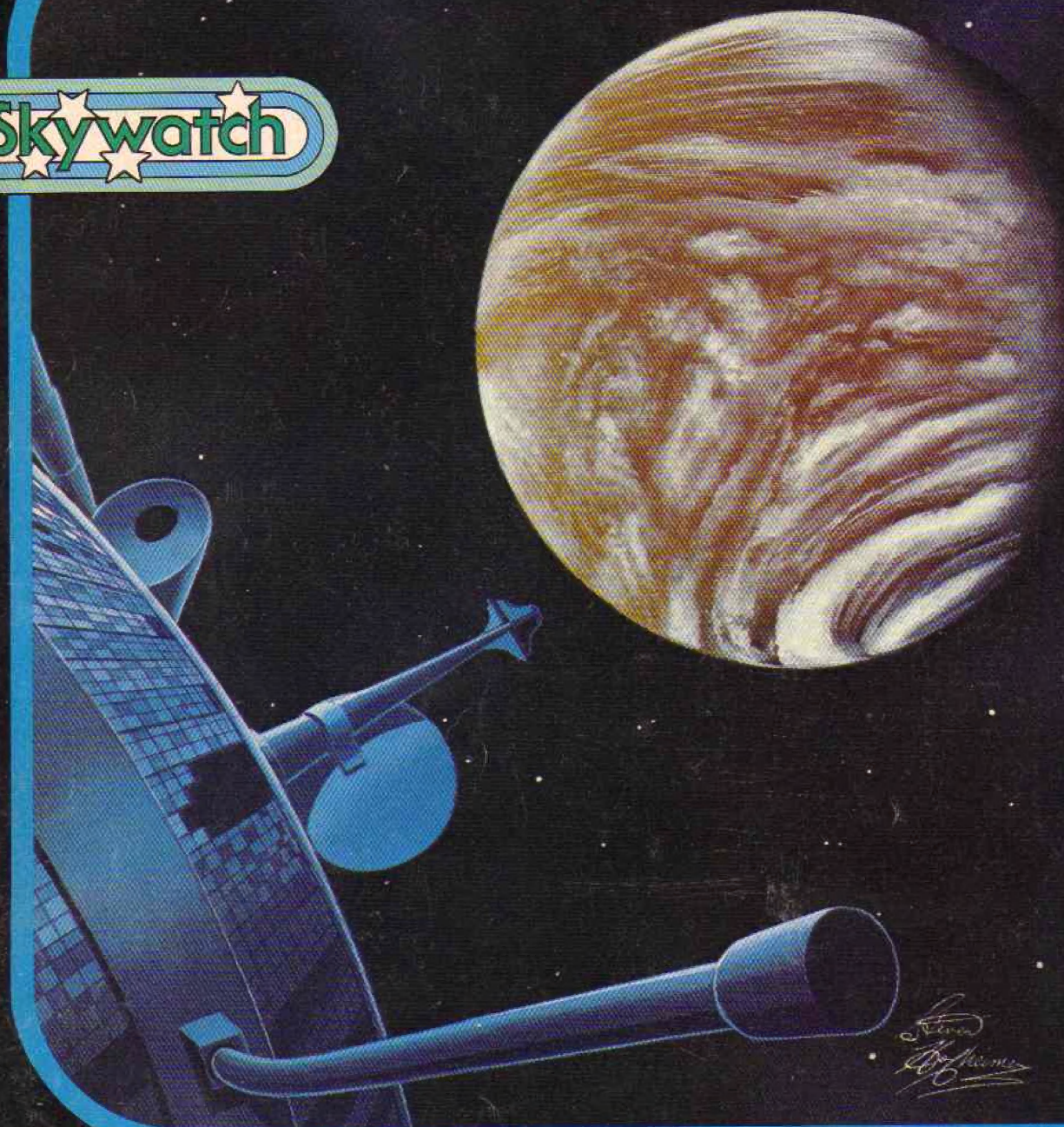
Someone weighing 75 lbs. (34 kg.) on Earth weighs about 68 lbs. (30 kg.) on Venus. And you? Multiply your weight times nine. Now divide by 10.



Early Theories: Once people thought that the clouds around Venus were made of water droplets and ice crystals. Since water is necessary to life, they thought this was a sign that creatures lived on Venus. We now know that the beautiful clouds of Venus are made of a deadly gas, called sulfur dioxide.

Modern Theories: The spaceship Pioneer Venus 1 began orbiting Venus in December of 1978. It has sent back lots of new information about the planet. Venus' surface is different from other planets we have seen. Usually craters are found in mountainous areas. But on Venus, most craters are in the planet's lowlands.

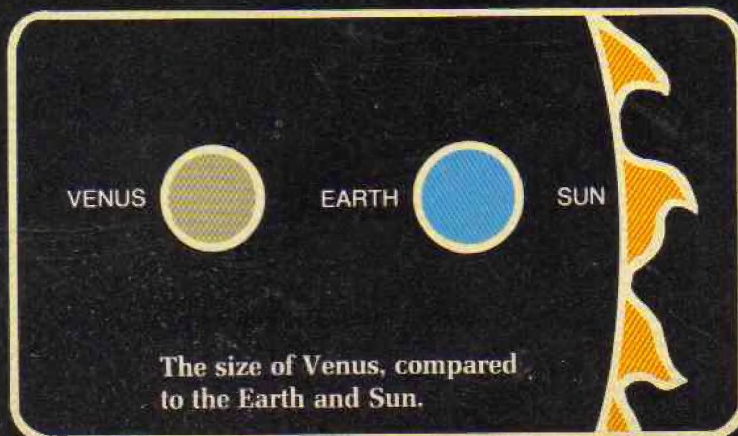
Skywatch



Above: The *Pioneer* spaceship approaches Venus.

Focus on Venus, the Morning and Evening Star

Venus is named for the ancient goddess of love and beauty. It is the nearest planet to us and is so bright that it can cast a shadow on Earth. Sometimes it is called the "morning star" and sometimes the "evening star." This is because you can only see it at sunrise and sunset.



Skysight:

This time of year, Venus is the evening star. Look for it on the western horizon just after sunset. (turn to page 47)